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ABSTRACT

This article, the 6th in a series of AAHE research reports, summarizes research on teaching and learning. Most studies on teaching methods conclude that there are no significant differences between the various teaching methods and student achievement. The problem with these studies is that they have concentrated on teaching and have ignored learning and the learner. There are many omissions in the research, such as what courses and subject matter areas promote critical thinking and a spirit of inquiry; and how students can be helped to become independent learners. Some studies in the past few years have begun to probe the underlying complexities of teaching-learning. One of the best examples of the new approach for both conceptualizing the issues and investigating them is the Instructional Gestalt. Many of the recently introduced approaches to instruction can be grouped into three categories: (1) personalized, individualized to process instruction (P-I-P); (2) experiential learning; and (3) acceleration programs. Results of this recent research points out that the role of the instructor must be altered and broadened. There can be a dramatic decrease in dispensing content and lecturing in the classroom without any decrease in the quality of learning. (AF)

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Teaching or Learning? *by Ohmer Milton*

This series of AAHE research reports is made possible by a grant from the W. K. Kellogg Foundation. The goal of the series is to summarize the thrust of current research on selected topics and to speculate on what this research implies for future practice.

Coordinator of the series is K. Patricia Cross, director of college programs, Educational Testing Service, and research educator, Center for Research and Development in Higher Education, University of California, Berkeley.

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A leading researcher [28] has captured our current substantive knowledge of the relationship between instruction and achievement in this cryptic analogy: "Prescriptions for 'how to teach effectively' are about as outdated as leeching."

This report will attempt to describe and integrate the research about the traditional or hallowed teaching approaches—for example, lecturing—in such a way that the evidence can no longer be viewed as equivocal. The tactic will be to mention as many subject-matter areas and as many surface conditions as possible. Faculty members have a proclivity for denying that research findings about learning apply to their own discipline, to their own behavior in the classroom, and to the creation of academic policies. An effort will also be made to point out significant research omissions, to emphasize instructional trends that appear promising, and to plead for a much broader role for the instructor than the stereotyped, restricted, and traditional one so much in vogue.

"No Significant Differences"

A recent and unique investigation [7] pooled data from a large number of studies on the relationship between achievement and teaching methods. The 91 studies that were used appeared in the literature between 1924 and 1965. In essence, the *data* from the studies were added together, a technique that differs significantly from the usual one of adding or summarizing *conclusions* in order to obtain an overall view. An uncritical pooling of conclusions has the sometimes disastrous effect of perpetuating unwarranted and unsupported claims which have been made in the original investigations.

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The 91 studies focused on, but were not limited to, the following courses and subject-matter areas: accounting, algebra, American government, biology, chemistry, child development, education, engineering, English composition, history, mathematics, physiology, psychology, quadratic equations, general science, natural science, physical science, speech, and statistics. Comparisons were made among the following approaches: lecture, discussion, combinations of the two, supervised independent study, unsupervised independent study, television, and programmed materials (books and machines). On the basis of the reanalysis of the data, it was concluded that:

> These data demonstrate clearly and unequivocally that there is no measurable difference among truly distinctive methods of college instruction when evaluated by student performance on final examinations.

This conclusion is consistent with several large-scale investigations which were not included in the "pooling" study. In one of them [10], different sections of history of western art, introduction to the earth sciences, American government and politics, philosophy, physical science, and problems in anthropology were taught. Three approaches to instruction were used: lecture-discussion, small groups without the instructor, and independent study. Reductions of time in class varied from 30 to 80 percent. Not only were there no substantive differences in achievement, but on a specially constructed learning resourcefulness test, there was no consistent pattern of results in favor of any of the procedures.

A most ambitious investigation [20] involved 23 separate courses enrolling approximately 4,500 students. Three types of instructional procedure—television, lecture, and discussion—were used, and classes varied in size. Again, no differences in achievement resulted from the "methods." In addition, there were no significant differences among the groups on a test of critical thinking.

Until the past few years, research in teaching-learning with young college men and women has tended to focus on single surface conditions to the exclusion of other factors and forces. Such variables as class size, frequency of class meetings, and manner of presentation, when considered in isolation, have no major impact on learning as measured by *content* tests. Even when some of the variables have been combined in investigations, their influence appears to be quite small. These studies apparently have proceeded on the faith that there is one best method of instruction for all students in all subject matter areas—an assumption of considerably dubious validity. Also, they may have been based on Thorndike's conception of learning—that the process is essentially the same whether the student is learning a simple motor task or a difficult abstraction. The modern conception, labeled "information-processing" and based upon extensive research, holds, on the other hand, that learning is much more complex than it was believed to be some 75 years ago [12].

Perhaps the persistent legend of Mark Hopkins on one end of a log interacting with a student on the other as the

ideal arrangement for learning helps account for the continuing belief in the potency and magic of these surface phenomena, particularly those characterized by face-to-face contact. Attention has been restricted to teaching; except as effects, *learning* and the *learner* have tended to be ignored. This is tragic because, in the final analysis, learning is an internal and personal affair; no learning theory postulates that one person can learn for another.

In addition, studies of teaching-learning have generally been timid in character [14] in that in most of them a given student was taking several other courses at the same time; as a consequence, the "experimental" influences were actually minuscule. Also, students who have been conditioned over the years to the "proper" patterns of learning and given a textbook, a course outline, and an impending final examination can easily re-create the pattern to which they have become so accustomed—initial and continuing passivity and finally a spurt of cramming. (By virtue of their age and years of experience, perhaps faculty members are more conditioned to the "proper" patterns than are students.)

While extensive data are not to be had about the classroom behavior of instructors, at least three studies—as well as anectodal data supplied by students—support the inference that most college teachers have indeed emphasized content by devoting much class time to dispensing information and explaining textbooks. In one of the studies [8], it was found that 319 faculty members from one university ranked lectures as the most used and most favored approach and believed the conveying of content was their most important contribution to learning. In another, an unreported study, a large sample of instructors were *observed* devoting nearly 90 percent of class time to lecturing. Finally, a survey [23] of 594 full-time faculty members in six senior colleges and universities revealed astounding percentages of them embracing the Doctrine of Formal Discipline—an ancient notion which was thoroughly discounted by rigorous experimentation during the first quarter of this century. For example, almost two-thirds of the 183 "hard scientists" included in the sample agreed with this statement: "The study of mathematics is especially important in helping students learn to think logically."

The point of the foregoing discussion is that gross simplifications of the teaching-learning situation are fairly meaningless, and at that level of discourse the conclusion that there are "no significant differences" is understandable.

Research Omissions

While there are frequent claims that most courses and subject-matter areas promote critical thinking or reasoning, a spirit of inquiry, and other qualities not bound by discipline, there are very few studies in the literature about this. Only two of the studies mentioned previously [10, 20] touch upon it even peripherally. Another significant omission is studies about helping students become independent learners. One exception [15] suggested that seniors have progressed little beyond freshmen in that direction. This paucity of studies persists despite the plea of one of the nation's most highly regarded educators and citizens, John Gardner, as long ago as 1958:

> It *is* important to accept the desirability of a rigorous reappraisal of present patterns and courageous experimentation with new patterns. This must include . . . at the level of higher education the trying out of approaches which place more responsibility upon the student for his own learning. [13]

In an unreported exploratory study documenting the inability of many students to learn on their own, approximately 100 above-average calculus students had freedom to choose among any one of three Ph.D. instructors (each with a regularly scheduled section) and to change instructors whenever they liked, or not to attend class at all. Class tests were given for learning purposes only; a grade was not assigned. Final grades in the course were determined by a departmental committee. The majority of the students complained on a questionnaire that they did not like the arrangement because they would not study unless *forced* to; almost half withdrew long before the final examination. On test days at least a third were absent, and in two of the sections, only four students asked—each on one occasion—that their papers be corrected. In the other section, the results were similar in that almost no students completed homework assignments or, when they did, requested that they be scrutinized.

Research Trends

Within the past few years, studies have begun to probe the underlying complexities in teaching-learning and to manipulate the plethora of variables which interact to promote different kinds of achievement. One of the best examples of this new approach for both conceptualizing the issues and investigating them is the Instructional Gestalt [28]. In this research model, several factors were selected from a galaxy of possibilities and the attempt was made to determine the interactions among them as they affected learning.

The influences on learning or achievement were grouped under four main categories: Learning Environment (class size, use of audio-visual devices, etc.); Instructor Variables (approach, degree and kind of personal contact with students, etc.); Student or Learner Variables (academic ability, prior knowledge of subject matter, motivation, educational set); Course Variables (subject matter areas, level, required or elected, etc.). Five courses were included in the study: zoology, physiology, educational psychology, business psychology, and Shakespeare. Two measures of achievement were sought—acquisition of subject matter and relevance of thinking.

The full richness and implications of the data cannot be explored here, but a few of the findings will be mentioned along with some of the modifications they suggest for the teaching-learning enterprise:

- Conceptually set students performed better than factually set ones.
- Academic performance deteriorated whenever the student's set (conceptual or factual) and the instructor's content emphasis were dissonant.
- Performance by low-ability students was facilitated in learning environments which reduced their perceptions of the likelihood of failure.
- Personal contact with the instructor for additional *clarification* of the material facilitated performance by low-ability students but inhibited performance by high-ability ones.
- Conversely, personal contact which was directed toward further *exploration* of the subject matter facilitated the performance of high-ability students but inhibited performance by low-ability ones.

The major implication of the Instructional Gestalt and the data derived from this one investigation suggest that the college instructor should no longer function as an isolated agent who presents material to students and tests them occasionally. Rather, he should be a manager of, or catalyst for, learning by serving as a member of a "learning resources team." This team would be composed of several specialists and would (a) monitor each student's previous attainments and cognitive and affective development, (b) set appropriate goals for the student on the basis of the assessment and monitoring, and (c) select from a battery of instructional aids those best calculated to help the learner progress.

Another recent study [21] has examined the interpersonal life and emotional events of the college classroom—forces which have been almost entirely ignored in the past. By means of a specially devised scoring system designed to capture affective messages, eight types of students were identified: compliant, anxious-dependent, discouraged, independent, hero, sniper, attention seeker, and silent. The data suggest some especially congent insights about the determinants of instructor behavior and ways in which the roles of instructors should be altered in the classroom.

Instructional Trends

Many of the recently introduced approaches to instruction can be grouped conveniently into three main categories: (a) personalized, individualized or process instruction (P-I-P), (b) experiential opportunities, and (c) acceleration programs. Several other innovative efforts [27] defy categorization and will not be discussed here. A large scale effort is underway at Evergreen State College [9], where certain of the instructional activities *require* a new level of cooperation among faculty members or traumatic alterations of their established roles. It is certainly to be hoped that all of these approaches will continue to be evaluated rigorously and that insensitive or inappropriate assessment procedures will be avoided.

In this connection, the "association" test deserves consideration. Several scholars maintain that word associations are a crucial indication of meaning. It has been found in economics, philosophy, and psychology [16] that students of different instructors in the same course produce different word associations to the same stimulus words and concepts. Additionally, there may be promise in devices other than the pencil-and-paper test. Some of these have been proposed under the rubric of "unobtrusive measures" [30]. Moreover, criteria must be expanded beyond the most common one of "amount learned" to include such measures as amount of time invested by both instructors and students and monetary expenditures.

P-I-P

A problem at all levels of education is the proliferation of labels for complicated techniques and procedures. Sometimes the labels convey far more than is intended; thus "individualized" and "personalized" may stimulate in many the vision of Mark Hopkins, a log, and one student. That vision is misleading and totally incorrect.

Although there are minor variations from investigator to investigator in applying the principles of P-I-P instruction, the essential features which distinguish this technique from conventional instruction seem to be these:

- The objectives are clearly stated.
- Each student proceeds at his own pace.
- A student may not move ahead to a new unit of study until he has *mastered* preceding requirements.
- Lectures and demonstrations serve as vehicles for motivating students rather than as sources of critical information.
- The use of proctors, both undergraduate and graduate students, permits repeated testing, immediate scoring, extensive tutoring, and a personalized learning context.
- Responsibility for learning is placed squarely upon the student.

Several studies [17] reveal one consistent result of P-I-P to be fewer low and more high grades than is typical.

One group of investigators in biology [18] has labeled this type of instruction the "process approach" and has included an additional feature: by a variety of means, each student's basic science achievements—for example, ability to perform simple arithmetic computations—are determined and any inadequacies corrected before the student moves on in the course. In a group of 144 students (80 percent had completed a semester of college chemistry and 78 percent had passed a semester of college physics and a semester of modern mathematics), it was found that only 15 percent could determine the volume of a cylinder and the area of one end when supplied basic data. And only 26 percent of the students could give the freezing and boiling points of water in Fahrenheit and Centigrade. The data from the diagnostic testing in this study raise numerous questions about remembering and forgetting and our revered "building-block" theory of knowledge.

At least one detailed, thorough, and comprehensive manual [1] has appeared for the development of P-I-P courses. The manual also contains reports of two studies. Another approach to be included within this domain is the audiotutorial method [25]. It is especially applicable to science courses and, among other advantages, reduces the space needed for laboratories.

Experiential Learning

One of the most dramatic developments on the academic scene in recent years is that of granting credit to students for learning in nontraditional ways. There seems to be the realization now that classroom learning—however we conceptualize it—is simply no longer sufficient; it must be supplemented by other kinds of experience—at work, in the home, through internship and field activities, and in travel and service abroad. Perhaps the most extensive undertaking along these lines is the University Without Walls [29].

Another concentrated and systematic effort to promote experiential learning within the framework of traditional degree programs is the Living Learning Center [19]—not to be confused with residential arrangements under similar names. Briefly, a student working with a faculty member plans very carefully how he will pursue a particular problem, how his performance will be evaluated, and the number of hours of credit which will be awarded. The program is open to all undergraduate students and a student may study almost anywhere in the world.

Acceleration Programs

In January 1971, the Carnegie Commission on Higher Education proposed that "The length of time spent in under-

graduate college education can be reduced roughly by one-fourth without sacrificing educational quality." [2] Faculty members have opposed acceleration programs in the past [22], and yet if they are to succeed, there must be active faculty support of them.

One of the most impressive, comprehensive, and exhaustive studies [11] about acceleration involved 1,350 youngsters of superior ability who attended 12 institutions of higher learning. These special students, called Fordlings, were matched against regularly admitted students, labeled Comparisons, on the basis of ability and other factors. On the average, the Fordlings had completed only the 10th grade and were 16 years of age in contrast to the Comparisons who had graduated from high school and were 18 years of age.

Year after year the Fordlings outperformed the Comparisons by a wide margin as determined by several indices. Exhaustive studies revealed, too, that they were "well-adjusted." A follow-up study ten years after graduation from college revealed that the Fordlings had continued to fare better than had their counterparts [26].

Perhaps the best known acceleration project has been the Advanced Placement Program; yet several studies [3, 4, 5] by its sponsor, the College Entrance Examination Board, have suggested that startingly high numbers of successful students have not been advanced by their colleges. The culprits seem to be faculty members.

Still another route to acceleration is through proficiency examinations, apparently available on many campuses, but seldom utilized [22]. These examinations hit at the heart of the dictum: "If you haven't had a course in it, you haven't learned." All of the institutions of higher learning within the New York state system [6] will soon award degrees on the basis of proficiency examinations.

Conclusion

The major themes of this report are that the vaunted variables of teaching-learning research are not the most important ones and that the role of the instructor within institutions of higher learning must be altered and most of all broadened. Research suggests that there can be a dramatic decrease in dispensing content in the prized ways in the classroom—the paramount activity of instructors for hundreds of years—without any decrease in quality of learning.

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